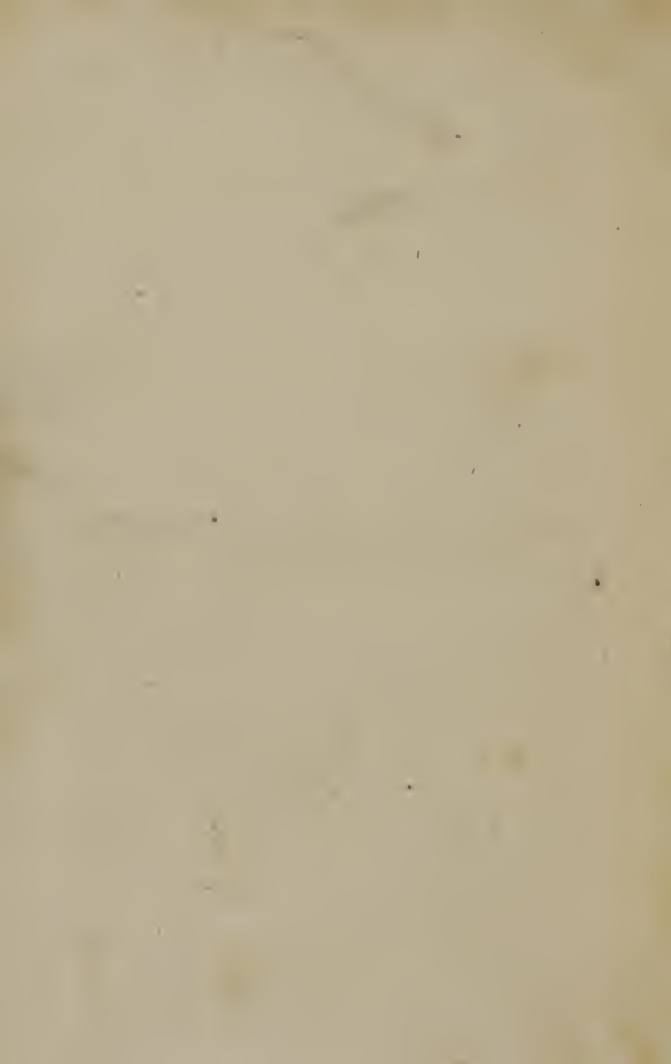


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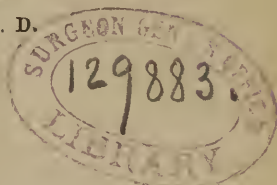
PROF. E. EMMONS
ANALYSIS.



THE
EMPIRE SPRING,
ITS
COMPOSITION AND MEDICAL USES,

TOGETHER WITH A
NOTICE OF THE MINERAL WATERS OF SA-
RATOGA, AND THOSE OF OTHER
PARTS OF NEW-YORK.

BY E. EMMONS, M. D.



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THE EMPIRE SPRING.

If there is one fact more interesting than another in the geological formations, it is found in the unity of their specific products. The occurrence of a single substance in a formation may be truly valuable and interesting, standing by itself; when, however, it is found by observation, that a formation may be regarded as a general reservoir of certain products or of analogous ones, or, in other words, when we find that products are distributed through the several formations under the influence of general laws, then it is, that their importance and interest is materially increased, and they assume that position in their relations to men and things which make a special research into their properties and uses highly valuable to community.

If the distribution of mineral products had been left to the operation of uncertain causes,

or if they were scattered through the series of rocks, or in masses distributed without regularity and order, or, if we were left without guide and way-boards to direct our researches, much that is to us indispensable would have remained unknown and concealed from view, and much that is essential to progress in the arts and civilization would yet remain to be discovered by the slow process of excavation, cheered only by the hope of a fortunate accident or the constant expectation of a lucky blow.

Iron is distributed in the formations of New-York, in five distinct series of rocks, in all of which are found quantities sufficient for exploration and commercial value. Coal, however, is unknown in this State ; its rocks belonging mainly to an epoch of anterior date. The lead-bearing rocks are generally unproductive. Quicksilver, which is associated with coal-bearing rocks, is of course unknown and cannot be sought with the least prospect of success. Leaving, however, the solid metaliferous productions, and turning our attention to the waters which issue from the strata, we shall find, that here too law and order prevail, and that these valuable resources of health, commerce, and the arts flow with great regularity, and belong to

formations of the same epoch. In support of this view of the subject we may glance the eye over the belt of country extending from near the region of Cherry Valley to Erie county west; through this whole distance sulphur springs gush out which are every where known by the exhalation of a peculiar product, the sulphuretted hydrogen or hydro-sulphurous acid. Chloride of sodium or water charged with common salt, is another product of the same belt of country, though more confined in its area. The formation to which each water respectively belongs is the Onondaga salt group, or in rocks immediately associated with it. That these springs have their origin in these red and olive colored shales, is sustained or supported by the fact that in the Helderbergh range, where they are entirely wanting, these springs are unknown. Plaster or gypsum is another product of this formation or era, and no where out of it in New-York have we now the least right to expect to find it.

We have then in this range of country to which we have alluded three distinct products in a single series of rocks, or of an era. We may not, however, assert that these products are limited to this series; they are rather like other mineral products in this respect: they

appear in other formations—thus the New Red Sandstone is the repository of both salt and gypsum in England, but this fact does not militate against the principle inculcated in the foregoing paragraphs, that eras produced certain products on a large scale, and gave them associations in a certain series of deposits which have relatively the same collocation the world over.

In the Onondaga salt group there is still another remarkable issue of natural waters, the Sulphuric Acid Springs, or water charged with acid sulphate of iron.

These springs contain a quantity of free sulphuric acid or oil of vitriol. Their acidity does not very materially exceed that of cider. They possess in addition to acid taste, a ferruginous one like that of a weak solution of sulphate of iron, though not in such excess as to make them decidedly unpleasant. It is not of course the place to speak of their medicinal properties, though I may add in passing, that they are strongly tonic in their action, and will, probably, be found on extensive trial, extremely valuable in certain cases of debility where chalybeates are particularly called for. I have alluded to these acid springs for the purpose of glancing generally at the products of this kind

in our geological formations. It will be observed then, that we have three important kinds of mineral waters in a single formation, or group, the Onondaga salt rocks, viz., the brine springs or springs of common salt, which contain in solution, also gypsum; sulphur springs in which sulphuretted hydrogen gives a strong character to the water, and lastly, the sulphuric acid springs, in which iron in combination with sulphuric acid in excess and in a free state form the distinguishing character or marks. These waters have been brought to notice quite recently, under the name of Oak Orchard Springs, from the fact that there is a cluster of these springs in the immediate vicinity of this place.*

The formation embracing these springs, is bounded below or inferiorly by the Niagara limestone, and superiorly by the Manlius waterlime. It is supposed, also, that the Medina sandstone, when its marly parts or upper portion is present and well developed, furnish brine

* The composition of these waters is as follows:—

	CHILTON.	EMMONS.
Free Sulphuric acid,....	82.96.....	31.680.
Sulphate of lime, ..	39.00.....	4.658.
Proto. sulph. iron, ..	14.32.....	19.616 incld.alumina
Sulphate of alumina,	9.68.....	00.000.
Sulphate magnesia, ..	8.28.....	1.920.
Silica,	1.04.....	0.310.
Organic matter,.....	3.38, 1 gallon	1.372 in 1 pint.

springs, but of less purity than those of the Onondaga springs.

Another remarkable range of springs exists in the eastern tier of counties, to which the celebrated New Lebanon Springs belong. These are truly Thermal, as those are termed whose mean annual temperature is higher than that of the place where they issue. The New Lebanon Spring maintains a uniform temperature of 70 degrees Fah. Of very much the same character is the spring in the north part of Williamstown, Mass., and two others in Hoosic, Rensselaer Co., N. Y. These springs belong to the Taconic system of Rocks, and probably issue from faults or fractures in the strata ; and hence rise from great depths ; and hence, too, we are furnished with the probable key to the solution of the cause of their elevated temperature.

The most remarkable element of these springs is the *nitrogen*, which constantly escapes from the surface, accompanied with the same phenomena as those attending the escape of carbonic acid. Hence these springs are frequently and with propriety called *nitrogen springs*. Of the solid elements, lime is the principal, but it exists in small quantities only ; indeed some of them are nearly pure, or free from soluble salts, and are employed for washing and the ordinary

purposes of the kitchen, and yet they are much resorted to for the cure of cutaneous affections, but they seem to owe their virtue to the free bathing and constant ablution of the surface, or perhaps more directly to cleanliness, than to special medicinal properties.

Having alluded to a few facts in the geological constitution of groups, and their associated products, I may now turn to the consideration of the subject matter of this treatise, the SARATOGA SPRINGS, which are so widely and favorably known for their beneficial influence upon the human constitution. It is an interesting fact, that here, too, the same general law with regard to the distribution of products does not fail us; the same law of similarity of constitution, gives origin to similarity in the constitution of its mineral waters.

The Saratoga Springs issue from the oldest of the sedimentary deposits. That they originate near the primary rocks but do not belong to them, seems borne out by the fact that there is no known locality where springs of a similar character issue from primary strata. The water of primary districts is generally of the purest kind, or in other words, free from saline matters and carbonic acid, and will usually wash as well as rain water. At Saratoga,

however, near the junction of certain fossiliferous rocks and the primary, waters highly charged with alkaline earths, iron, &c., and retained in solution partly by carbonic acid, flow freely and at a uniform rate.

Contrary to the opinion just expressed, that they belong to the lowest sedimentary rocks, it may be maintained that as the Ballston and Albany springs, which possess the same general properties, issue from the Hudson river slates; and hence the Saratoga waters may originate in a series of rocks far removed and at a distance from them. It cannot be denied that there is considerable obscurity in the question touching the origin of these fountains. Still, it is more consonant to the phenomena attending their flow, as well as their composition, to regard them as belonging strictly to the lower limestone series of the New-York system—the calciferous sandrock,—Chazee and Trenton limestones. This view is supported by the fact that all these lower limestones are more or less magnesian, and contain, also, matters more or less soluble, especially those parts of the calciferous sandstone, which is so frequently employed for water cement.

Leaving the question of their origin for discussion in another place, I will proceed to state

more definitely the facts connected with the geology of Saratoga and its vicinity.

The rocks of Saratoga belong to two different systems, leaving out of view the deposits which may be regarded as belonging to the tertiary and boulder systems. The inferior rocks, as is already well known, belong to the primary system, and consist of granite, gneiss, and hornblende. These rocks approach within a short distance of Saratoga Springs, plunging deeply into the interior, and which support at a great depth the limestone and sandstone through which the water of the springs issues.

The primary rocks form all that northern part of the county west of Glens Falls north of the springs, and a part of Galway, and appear in the ranges known as the Palmertown and Kayaderosseras mountains. They are but low and inconsiderable ranges, yet present frequently steep and abrupt precipices, some 50 or 100 feet in height. In their progress from the S. W. to the N. E., they seem to be arranged in echelon columns with great regularity, and present that peculiar appearance on the whole stage route from the springs to Whitehall.

Crossing these ranges from the S. E. to the N. W., it is found that the traveller encounters other ranges in succession, and of greater

height, until he passes the main ridge, to which Mount Marcy belongs, whose elevation exceeds 5,300 feet, and which, with the neighboring clusters, form the Adirondack mountains, and which really constitute the culminating points of a great range which commences near Little Falls, in the Mohawk valley, and which terminates at Port Kent, on Lake Champlain.

But the rocks which are of the most interest to us, are those connected with the Saratoga springs. They form one entire group or series, or rather a division of the New-York system.

The members of this division in the ascending order, are,—1. Potsdam sandstone. 2. Calciferous sandstone. 3. Birdseye. 4. Trenton limestone. 5. Utica slate, together with a series of slates, alternating with gray sandstone, which, in their aggregate, forms the Hudson river group. This entire series constitutes the Champlain division of the New-York Geologists. The lowest of this series, the Potsdam sandstone, makes its appearance about two miles west of Saratoga springs, and in a position but little inclined. It is gray or brownish gray, and granular, and in some places its beds are quite even and free from imperfections. It is about 300 feet thick; this rock succeeds the calciferous sandstone. It is a rock in which

calcareous matter is distributed, but it is always an impure limestone, containing silex, magnesia, and iron, with some alumina. Its constitution, in some localities, renders it fit for a hydraulic cement. Lithologically, it is a silicious limestone, the silex of which is in two distinct states; that of chert, as in the variety at the Springs, a substance closely resembling flint, and in that of grains more or less rounded. Often the silex is in fixed crystals; its entire thickness is about 300 feet. It varies in thickness at different localities. Between the calciferous sandstone and Trenton limestone, two other subordinate beds of limestone occur, both of which are fine-grained, often black, rarely light, or cream-colored. They are known as the Birdseye and Chazy limestones. Another intercalated mass is known and distinguishable as the *seven foot tier*. This last mass, when sound, and of fine black color, forms a beautiful marble, and receives a fine polish. The division is computed by the supposition of a series of beds of slate, alternating with layers and beds of grey sandstones, and which is superiorly composed of thick beds of sandstone, predominating over the slate.

But the most important circumstance connected with the issue of the waters of the springs

at this locality, is the displacement which the rocks have suffered. This is occasioned by a force acting from beneath in such a manner and with sufficient power to fracture them on a line running northerly and southerly. On the west side the rock is considerably elevated, and on the east depressed; or their continuity is broken, the masses being displaced, have suffered that kind of movement which geologists term a *fault*. To satisfy one's self of this, it is only necessary that the mural wall upon the west side of the valley of fountains be examined with care, when it will be found that the platform of rock is the calciferous sandrock highly charged with chert, and the lower side or the valley is underlaid with the Trenton limestone. There is, therefore, in this case, a change in the relative position of the strata, the lowest rock has become by elevation higher than a mass geologically above it.

This line of fracture marks the westward limit of a disturbed belt of country, principally in the range of the Hudson river and valley, and which when measured in its full extent, passes north of the valley of Lake Champlain, and southwardly to the Highlands of Putnam and Dutchess.

To the circumstances detailed above, we are

to attribute the origin of the springs. A line of fracture is always prolific in living fountains. They have in this case a common origin, and which undoubtedly is quite deep in the interior. The temperature of springs is determined by the depth from which they arise; those being the evenest and most uniform in their temperature which issue from deep fractures. Others which are superficial, and flow only from gravel and clay beds, or the most recent deposits, vary in temperature with the seasons. In this respect, they resemble wells.

The warm and hot springs of Virginia, at Bath, issue also from fractures or lines of fractures. Undoubtedly there should be a free exit or passage for the water in all cases when the temperature is high, as in passing slowly and with obstructions upward the temperature would be reduced to that of the surface strata from which they proceed; so too, the strata must modify the composition of the waters more or less according to the soluble matter they contain. This is quite rational, as the carbonic acid with which they are charged is a solvent of considerable power. Hence calcareous strata or ferruginous strata, will furnish solid matter and more or less alter the condition of the water *itself*. At Saratoga, those

springs which are tubed upon the rock, as the Empire and Congress Springs, contain less iron than the others upon the same line of fracture. Those which pass through the sand, gravel or clay beds meet with iron, which is readily dissolved and which is as readily disengaged from its union with carbonic acid when the acid escapes in the contact with the atmosphere, or when the pressure upon the water is removed. Hence a slight loss of carbonic acid in the water, if it is not in great excess, deposits the iron in the form of red or brown powder. For the same reason, the lime is deposited on standing,—the least soluble bodies first fall, followed in succession or in the order of their solubilities respectively. The alkaline bodies whose solubility is excessive, remain in solution as long as liquidity is maintained, while the carbonates of iron, magnesia and lime become precipitated immediately upon the escape of carbonic acid. The pressure of carbonic acid probably favors the absorption and subsequent action of ferruginous compounds in the system, inasmuch as experience proves that even large doses of iron taken into the system when comparatively insoluble, act upon the system but inconsiderably. To this cause too we may attribute the more active and beneficial effects of the water

when used at the springs than at home, when drank from bottle. But to return to the consideration of one or two geological facts which stand in connection with the origin and character of these springs.

It is as I have stated on a line of fracture or fault that the springs rise to the surface. This might have been inferred from observations on other fountains at a distance; but here the fracture is visible, especially towards the north end of the valley, where the Empire and iodine springs appear. So the cluster of springs known as the *Ten Springs*, issue from the earth under the same circumstances. Ballston Spa, issuing from a slate, might perhaps, be regarded as an exception. But it is probable that the fracture exists, and that it is a prolongation of that which occurs at Saratoga; but the rocks are not sufficiently disturbed or elevated to expose the limestones below the slate, and the slate itself being very uniform and closely packed, its circumstances do not favor its appearance. The slate, however, is an unfavorable rock for taking and for confining waters—a slight increase of pressure, in every instance, is sufficient to force the waters into new channels between the lamina of the slate and when

a passage is formed will remain to direct the water in that direction.

Having very briefly considered some of the facts connected with the geology of Saratoga, and the phenomena attending the issue of the springs from the rocks, I shall proceed to speak of the composition and use of the water of this place :

THE EMPIRE SPRING.

This spring is the last which has been brought to the notice of the public. It had been imperfectly known for many years, but its value had not been tested until about two years ago. In consequence of an imperfect tubing it had always appeared to belong to one of the weaker springs, but afterwards, on the exclusion of surface waters, its properties became at once decided, and it was evident that it was a valuable spring. This view of its character was greatly strengthened when it was found that it is an excellent water for bottling. So rare is it that a water will stand this test, that even a weak water is valuable if it preserves its transparency under these circumstances. The difficulty to be overcome in bottling is to prevent the carbonic acid from escaping, for as this substance is one of the most impor-

tant solvents of the carbonates a loss of a small portion only, is sufficient to allow the iron to fall and pass into a free state. When the water becomes less transparent and sparkling and the brownish sediment destroys entirely its value as a beverage; and, as I have expressed an opinion in another place, the preservation of sufficient carbonic acid to preserve the solid matters in a state of perfect solution, is quite necessary, in order that its full influence upon the system may be obtained, inasmuch as then the entire amount of saline matter will be taken into the system, and will also increase their action upon it when taken into it. Experience proves in the case of most persons, that when these waters are drank after they have lost their carbonic acid they usually create unpleasant rather than agreeable sensations.

The principal constituents of the Empire water may be stated as follows:—

Chloride of sodium,	269.696
Bicarbonate of lime,	141.824
Bicarbonate magnesia,	41.984
Bicarbonate of soda,	30.848
Hydriodate of soda,	12.000
Bicarbonate of iron,	trace.

Specific gravity,

In obtaining the hydriodate of soda for the

foregoing analysis, the same method as that pursued by Dr. STEELE, in his analysis of the Congress water, and as given in the last edition of his work was adopted. It gives too much iodine, no doubt, inasmuch as the product contains some organic matter, with chloride of palladium; the hydriodate of soda amounts to 9 grs. per gallon. Its presence is easily detected in an ounce of the water when the dry salt is employed and free from common salt.

The following remarks are copied from the *American Journal of Agriculture and Science*, and the facts as stated in 1846 have been fully corroborated by observation and experience :

“The most remarkable fact brought out by this analysis is, the presence of a large quantity of iodine. We were able to detect it in one ounce of the water. This water, too, is mainly free from iron, as tincture of nutgalls after standing twenty-four hours produced merely a green tinge or color, and the salt when evaporated, is white or slightly yellowish white. The spring, it seems to us, is quite an accession to the waters of Saratoga. It has a remarkably pleasant saline taste, with a pungency and liveliness which makes it agreeable as a beverage. For bottling it is equal to the Congress,

remaining transparent longer than that water when its carbonic acid has escaped."

It is situated a few rods north of the Iodine Springs, and has been fitted up in a very superior manner. Water, when tested with nut galls, for iron at the spring, it is said furnishes a distinct blue or purple; when, however, the water has been bottled for a time, and the water poured out in a tumbler in the usual manner, and tasted, its presence is not indicated by change of color. Admitting its presence, it is clearly established by experience that the quantity is so minute that its influence can never become injurious, and that it may be used freely in all cases of disease when the use of iron would prove too exciting in its effects.

The effects of mineral water upon the system must depend upon the action of each separate substance, and the combined influence of the whole.

There are three effects obtained by the use of such waters.

1. That which is called a tonic effect, or that which increases the force of the heart and arteries, and imparts vigor and strength to the system, promotes digestion, and favors the action of the nutrient vessels.
2. An increased peristaltic movement, or the action of the bowels.

3. The deobstruent effect, or an action by which obstructions in certain viscera exist, and in which there are functional derangements.

Now the Empire spring contains elements which are competent to effect the three kinds of influences which are attributed to mineral waters. The first effect, that which gives tone and strength to the system is promoted mainly by the bicarbonate of lime, a substance whose action in mineral waters is usually overlooked or disregarded. Its influence is effected by its action upon the stomach, by promoting digestion. Its tonic effects are mild, and it operates without inducing preternatural heat or febrile excitement.

The second effect, an increase of peristaltic motion is promoted principally by the chloride of sodium, aided by the bicarbonate magnesia and soda.

The third effect, the removal of obstructions is clearly brought about by the hydriodate of soda mainly ; still, when the combination of the elements of these waters is considered, we cannot but regard this effect as one jointly brought about through the influence of the compound—or rather, the influence of the compound is by no means to be lost sight of. Another view which we may for a moment consider, is that

which is involved in the specific and general effects of the water upon the system. Thus, experience bears us out in the correctness of the position, that specific effects follow from its use, the most remarkable of which are seen in the removal of enlargements of organs, as that of certain glands. The removal of cutaneous affections may or may not be by specific effects. It will not be proper to take up time in the theoretical points which it is easy to raise in respect to the action of these waters.

It is more important to dwell upon the diseases which have been either cured, or whose strength has been broken and partially subdued by their use. The most formidable of the cutaneous affections which have been cured, are scald head, and other cutaneous affections; ill-conditioned ulcers, particularly of the extremities are greatly benefited by this water. Some severe and long-continued cases of the first-mentioned disease have been removed and effectually cured. Ill-conditioned ulcers, wherever seated, are rarely cured by topical applications alone. When, however, the use of these waters are persisted in till the secretions are performed, healthily a change for the better rarely fails to follow, especially when aided by rest and frequent bathing of the part by the wa-

ter There are more failures, undoubtedly, to be attributed to a want of constancy in the use of the water, or by irregularity, than by a want or absence of virtue in the remedy. So too, it is proper that we should be aware that there are many cases where the water itself will fail in restoring a healthy state of the functions. In these cases, the blue pill, taken at bed time, or tea-spoonful doses of sulphate of magnesia, the use of rhubarb, etc., may be required, according to the indications in each particular case. A physician is the only person who is competent to advise in these cases, and it fortunately happens that there are eminent gentlemen at the Springs whose ample experience as well as acquirements, qualify them for the management of difficult and obstinate diseases. Indeed, there is probably no rule better established, than the one that when the waters fail to move the bowels, and a febrile state is either engendered or increased, aid by the blue pill or some other mild non-irritating aperient becomes indispensable. No opinion should be formed unfavorable to the use of the waters until such aid is obtained. It is often found that when the system is once relieved in this way, favorable symptoms make their appearance in the mitigation of the disorder, and followed with the

diminution or the fever and irritation, and a more quiet sleep.

Another disease in which the Empire water may be drank to advantage is, scrofula, together with those kindred affections, where there is a depraved habit of body accompanied with functional derangements. In these cases there is usually a strong tendency to one of the forms of phthisis pulmonalis or consumption. In these and allied cases, however, there can be no greater error probably committed, than to place confidence entirely in one single remedy. The beneficial effects of the water will be for a time decided, but as cases of this kind are lingering, resort must often be had to other remedies. A judicious alternation of the more active chalybeates alternating with the use of spring water, holds out the most probable way of relief. It has been held as an established fact, that in consumption all the waters of Saratoga are injurious. The Empire water, however, has been employed with salutary effects. Consumptive patients have drank it freely, and yet, instead of fever, irritation and increase of cough, temporary relief has followed, together with diminution of night sweats. Still, it would by no means be proper to hold up this water as a cure for this disease, and yet, a

mitigation of its force, if only temporary, is an advantage of great consequence.

From the foregoing remarks, it is evident the Empire spring fills an important place in the course and plan of treating diseases by the use of mineral waters. The absence of iron to all intents and purposes, cannot be regarded as an unfavorable circumstance, inasmuch as this element is so common, that there is no difficulty in supplying it in all cases where its use is indicated. The iodine which can be detected in the salt obtained from one ounce of the water, is specially adapted to the successful treatment of scrofula and cutaneous affections, and its activity upon the bowels is sufficient to remove that torpidity incident to sedentary habits and an inactive condition of the liver.

The principles which have been established by long experience of the physicians at the springs, relative to the time when the waters may be drank, and how much is required for a dose, holds good in the use of the Empire spring;—the morning before breakfast three or four tumblers, or more in certain cases, may be drank, or in other words, a quantity sufficient to act upon the bowels, determined by experience, as this is the effect desired ; but in some cases, especially when a patient first begins the

use of the water, it is better to resort for a few evenings to the blue pill or rhubarb, or other laxatives, than to compel the stomach to receive so much as may be sufficient to produce a distressing fulness.

In addition to this period when it may be used, a tumbler full may be drank before dinner. Evening may be regarded also, as another period when the water may be taken to advantage,—yet, to make the stomach a common reservoir or cistern, is decidedly injurious. It is like eating between meals.

It is however, impossible to lay down all rules for the use of this or any of the spring waters of Saratoga,—there is so much individuality in each case, so much that requires special attention and the special direction of a physician, that in almost any case advice will be required. There are certain general rules, and there are also certain diseases to which the waters are better adapted than others. These general rules will prevent many errors in the use of water—but will not suffice for the entire control of the invalid. This view of the subject is clearly sustained by the fact, that some invalids really require the laxative effects of the water; others, what is called the alterative effects. Some require their tonic properties.

Now the judgment of the patient can rarely lead him aright.

In accordance with the design of this work, I shall state the composition of several springs situated along this valley of fountains, as well as a few others at a distance, and which belong to other geological formations. Their composition furnishes a general guide to the properties which they severally possess, and it seems, will furnish also, a kind of information of general utility.

I. Congress Spring.—This is at the head of the valley, and contained in one gallon—

Chloride of sodium,	358.439
Carbonate of soda,	7.600
Carbonate of lime,	80.797
Carbonate of magnesia, . . .	76.721
Carbonate of iron,	4.851
Hydriodate of soda,	3.920
Silica,	0.472
Alumina,	0.321

Solid contents. 533.121 grs.

In 1840, its solid contents, according to CHILTON, amounted to only 298. grs.

In 1843, to 410.

By another author it amounts to 597.94 grs.

Another element which has been usually overlooked in all acid springs, is *phosphoric acid*, in combination with lime. I discovered this substance in 1847, and supposed, at the time, that the discovery was new, but afterwards found, that I was anticipated by SILLIMAN, so far as phosphates have been discovered in our natural water. [See Silliman's Elements of Chemistry, page 484.] There is no doubt that this is an important fact, and may be laid hold of in treating some diseases in which the waters are rarely used, as rickets, though with us it is comparatively an uncommon disease. So in addition to the foregoing, I may add, that the remedy acts through the medium of the skin and kidney, and it is a nice matter so to adjust the remedy as to secure that specific action which each case requires. For instance, there are many cases when these waters would be eminently useful, provided their use was so adjusted as to act either upon the kidney or skin, but would prove highly injurious if they acted freely upon the bowels. If this specific action is not attainable by the water alone, medicinal adjuncts are required. The skilful physician will act like the skilful musician, he will touch only those keys which produce harmony. The uninformed patient will act a rude

part with the strings, and strike, perhaps, the most delicate with the most power. Let the invalid ask the advice of his physician, and let him obtain specific directions for his own case; and it should be remembered, that each case has a certain degree of individuality, and must not always be taken as the standard by which to treat others. What I mean is, that each case should be treated upon its own conditions, to be varied by constitution and stage of the disease. What may have been highly proper at one stage may become quite questionable, if not decidedly injurious, in another. All these facts and circumstances put together, serve to enforce the rule I have proposed, that of being guided by a competent physician in the use of these waters. He who is seeking pleasure in the plenitude of health will find it, no doubt, in the luxury of drinking at the sparkling fountain, and with little danger of injury, either in the present or future, but it is not so with the invalid.

The *Putnam and Iodine Springs* furnish by analysis the following elements, in one gallon:

	<i>Putnam.</i>	<i>Iodine.</i>
Chloride of sodium,	214.00	187.0
Sulphate of soda.	1.68	—
Carbonate of soda,	14.32	2.0
Carbonate of magnesia,	51.60	75.0
Iodine of sodium,	2.00	3.5
Carbonate of lime,	68.80	26.0
Carbonate of iron,	7.00	1.0
Sulphate of lime,21	
Alumina,56	
	<hr/> 361.01*	<hr/> 294.5
Carbonic acid,	326.4 inches.	326.
Atmospheric air,	6.4	4.
	<hr/> 332.8	<hr/> 330.

The *Putnam Spring*, it is evident, is a decided chalybeate; there is probably at least in combination with phosphoric acid, and I have detected phosphate of lime. It is unsuitable for bottling, but still it has its favorites, and is no doubt a very valuable spring.

The *Iodine Spring* is also valuable, and is esteemed highly by many, and deserves, I believe, all that has been said in its favor. It de-

* From North's Guide to Invalids.

posits a small sediment on standing, and hence has a blemish in its bottling properties. Still, drank at the fountain, it is highly agreeable. This too is peculiar for the small amount of iron it contains, for the increased quantity of iodine over the Congress Spring, and hence is adapted to those complaints where iron proves too irritating.

The *Washington Spring* though I believe it is not very much esteemed, yet is well worthy of attention, from the large amount of phosphate of lime and iron it contains; 2.44 grs. of phosphates were obtained from 1000 grs. of water; 2067.34 grs. of chloride of sodium in a gallon of water. It deserves a more careful analysis and trial for testing its efficacy in scrofula, rickets, &c.

The Hamilton Spring gave Steele in his analysis—

Chloride of sodium,	297.3
Hydriodate of soda,	3.
Bicarbonate of soda,	27.036
Bicarbonate of magnesia, ...	35.2
Carbonate of lime,	92.4
Carbonate of iron,	5.39

Gaseous contents in a gallon, 320 inches.

This spring is entitled to the same remarks

as the Washington—as about the same amount of phosphates, though rather less, have been obtained. From the rather ferruginous taste of these waters, they are not drank so freely as may be desirable in many instances.

When it is enquired how it happens that the phosphates become so frequent in these waters, it will be found that the solution of the question is by no means difficult. Carbonic acid is an active solvent of the phosphates. Bones exposed to the atmosphere become corroded by carbonic acid. So water charged with carbonic acid dissolves freely the phosphates of the rocks and soil through which it passes. Bones placed in Seltzer water, undergo solution or become softened, and phosphate of lime is found in the water. To the presence of carbonic acid in rain water, we may explain in part the distribution of the phosphates in the soil, a fact of great importance in agriculture. Calculi of phosphate of lime may be dissolved in the bladder by the spring waters of Saratoga,—and it is no doubt the true rationale of the operation of all the aerated waters in mephritic and calculus complaints.

Townsend's Rail-road Spring.—The analysis of this water not having been published, I deem it proper to subjoin it in this place.

Amount of solid matter in 1000 grs. of water:

Chloride of sodium,	2.329
Bicarbonate of soda,	1.598
Bicarbonate of magnesia,	1.510
Bicarbonate of lime,	0.819
Bicarbonate of iron,	trace.
Silica,	0.020
Original matter,	trace.

6.307

Iodine was not detected in 2,000 grains of water. This water, probably, may be bottled with success. It has not, however, been used, and its character has not been sufficiently tested.

The *Quaker Springs*, in the neighborhood of Bemis' Heights, have the following composition in 1,000 grs.:—

		One pint.
Chloride of sodium,	1.498	11.614
Bicarbonate of soda,	3.299	24.806
Bicarbonate of lime,	0.287	2.203
Phosphates,	0.020	0.150
Magnesia,	0.020	0.150
Silica,	0.025	0.160

5.15.

Iodine was not detected in 3,000 grs., by chloride of palladium.

This spring is remarkable for the excess of carbonate of soda over the chloride of sodium, and hence its saline properties are apparently weak.

*Analysis of the Ferry-street Mineral Spring,
Albany.*

Amount of solid matter in one gallon :—

Chloride of sodium,	379.325
Chloride of lime,	22.237
Phosphates of iron, lime and alu- mina,	8.696
Magnesia,	8.755
Silica,	5.836
Hydriodate of soda,	1.159
	<hr/>
	726.008

Temperature, 220 feet below the surface,
50.51. Fah.

Specific gravity, 1.006.

This water is decidedly tonic, and many have experienced its invigorating effects upon their systems. It is rather saline to suit the palate, and is an excellent laxative. External applications are beneficial in a variety of cutaneous affections, and it deserves more attention than it has hitherto received from physicians and invalids. The well was sunk to the depth of

600 feet, and the first 20 or 30 feet the water is sulphurous.

Several distinct treatises on the waters of Saratoga have been given to the public, all of which have their own peculiar merits ; and all are well worthy the careful study of the invalid. Of these works, the first in order of time, is that from the labor of the late Dr. Steel, who became eminent at this place as the principal consulting physician. His memory is deeply cherished by the inhabitants of the village and vicinity.

Drs. NORTH, ALLEN, and PERRY, have each given their own views, in part, of the use of these waters, and they form valuable records of their experience in their use.

For this work, no particular merit is claimed ; it was designed originally to have been a full treatise upon the mineral waters of the state. The press of other business, ill-health, and a variety of causes, have operated to prevent the fulfilment of the first design. If, however, a freedom from pressing engagements should occur, I hope in time to be able to fulfil my wishes.

EMPIRE SPRING.

The water of Empire Spring is bottled with the utmost care, and in strong boxes, suitable for exportation, by the subscriber.

The boxes are marked as follows:

“EMPIRE.”

THE CORKS OF ALL GENUINE
EMPIRE WATER ARE BRANDED
THUS:—



G. W. WESTON & CO.

